AGENDA FOR MEETING ON RESPIRATORY IRRITATION OF CARPET CHEMICALS
9 AM, DECEMBER 15, 1995
ROOM 410B/C, CPSC HEADQUARTERS, BETHESDA, MD

1 2/12/96

I. Introductory Remarks	CPSC & Carpet and Rug Institue
II. Concentration-Irritation Response Data for Carpet System Chemicals	
A. Industry Studies	DuPont & Monsanto
B. Protocols Used in CPSC Study	CPSC & Air Quality Sciences
C. Discussion	All
III. Respiratory Irritation of Chemical Mixtures	
A. Protocol Development	Carpet and Rug Institue
B. Protocols Used in CPSC Study	CPSC & Air Quality Sciences
C. Discussion	All
IV. Other Issues	All

MEETING LOG

DATE :December 15, 1995 at 9 AM - noon

PLACE :Room 400 B/C, CPSC Headquarters

ATTENDEES :See enclosed list

SUBJECT : Respiratory Irritation of Carpet Chemicals

Background

The Carpet and Rug Institute (CRI) requested a meeting with CPSC staff to share some of their initial results from sensory irritation testing of chemicals emitted from carpet. The studies are being conducted by DuPont Haskell Laboratory and the Monsanto Toxicology Laboratory. This testing was first proposed to a Federal Government Work Group in September 1993 as part of a Carpet and Rug Institute-sponsored indoor air quality research program. Understanding the sensory irritation of carpet chemicals may be important since symptoms consistent with this type of adverse response have been reported to be associated with new carpet installation. CPSC staff discussed methodologies and protocols used in the agency's own on-going contract to study sensory and pulmonary irritation of carpet system chemicals. They did not discuss results of the testing. This data will be made available to the interested public after agency review of the final contract report.

Industry Testing

Dr. Richard Dudek of Monsanto discussed the selection of 58 chemicals for sensory irritation testing from a large carpet chemical emission database. Chemicals emitted from more than two percent of the carpets, or chemicals emitted at rates higher than a predetermined 24 hour emission factor were selected for testing. Testing followed the standard ASTM E981 protocol with a 10 minute preexposure period, 30 minute exposure period and 10 minute post-exposure period. The ASTM E981 method measures a characteristic depression in respiration of exposed mice as an indicator of sensory irritation. Each compound was initially tested at 1000 ppm or maximum achievable air concentration, whichever was less. If the mean respiratory depression was 20 percent (RD20) or greater, the compound underwent further testing to characterize the RD50 and the slope of the concentration-response curve. RD50 values on about half the 58 chemicals were reported. Some chemicals underwent testing at both Monsanto and DuPont Haskell to characterize inter-laboratory differences. The RD50s of these chemicals were within about 3 or 4-fold of each other. The rest of the sensory irritation testing of individual carpet chemicals are anticipated to be completed in the Spring. Some of the data will be presented at the March, 1996 Society of Toxicology meeting and the data will eventually be published in the peer review literature.

Dr. Judy Stadler of Haskell presented ideas for studying sensory irritation of chemical mixtures in order to characterize interactions among different chemicals. She proposed challenging mice to mixtures of carpet chemicals whose sensory irritation had been well characterized using the ASTM E981 protocol. The exposure concentrations of each individual chemical contained in the mixture would be just below the levels required to produce a statistically significant respiratory response. The sensory irritation of the mixture could then be compared to the response expected for the sum of the individual chemical constituents (additivity). Haskell is now in the process of developing a statistical model that can be used to identify the threshold response for individual chemicals as well as statistical methods and study designs that are capable of determining mixture interactions that deviate from additivity.

CPSC Study Protocols

Dr. Val Schaeffer, the staff project officer for the CPSC contract, presented background, objectives and the work plan for the CPSC respiratory irritation study. The contract was divided into two tasks. Task 1 investigated the sensory and pulmonary irritation of 17 individual carpet system chemicals using the ASTM E981 method. These only included compounds that did not already have reported respiratory irritation data. They were chosen on the basis of a structure activity analysis, as well as the prevalence and magnitude of emissions from carpet and carpet cushion reported in previous studies. The identity of the compounds was not revealed, however there was some overlap with the compounds selected for testing by the industry. Compounds were initially tested at 500 mg/m^3 or the maximum achievable air concentration, whichever was less. If there was evidence of the characteristic respiratory depression below that considered to be within the normal range (RD $>$ 12 percent), the compound underwent further testing to characterize the concentration-response curve.

Task 2 investigated the respiratory irritation of synthesized mixtures of carpet system chemicals representing emissions from different carpet or cushion product types and systems. These mixtures contained chemical concentrations 10 to 100-fold higher than, but in same relative proportions as, the chemical concentrations encountered during product emissions testing using standard environmental chamber methods. Testing at enhanced air concentrations is necessary since the respiratory response in mice occurs at higher irritant concentrations than that required to cause symptoms in humans. If the initial mixture testing caused significant respiratory irritation, then follow-up exposures were conducted in order to identify the individual components responsible for the irritation and to characterize the concentration-response. A limited number of defined binary (mixture of two compounds) and ternary mixtures (mixture of three compounds) of carpet system chemicals were studied to investigate chemical interactions. The mixtures consisted of compounds with a well-characterized concentration-irritation response and which are found emitted together from carpet/cushion products or systems.

The respiratory irritation data will be used by CPSC staff in a screening level

risk assessment to identify potential irritants emitted from carpet and carpet cushion that may explain the human health complaints.

Dr. Bill Muller from Air Quality Sciences, Inc (AQS), the principal investigator for the CPSC contract, presented the protocols used to generate the chemical vapors, measure the respiratory irritation, and analyze the vapor concentrations. Dynamic test atmospheres were generated using standard J tube methodology or, in some cases, a flask evaporation technique. Mice were pre-exposed to room air for 30 minutes to obtain a baseline control respiration rate, then exposed to test vapors for 60 minutes to evaluate any respiratory irritation patterns, followed by a post-exposure to room air for another 30 minutes to evaluate respiratory recovery. Respiratory waveforms were evaluated for pulmonary as well as sensory irritation during these head-only exposures. If signs of pulmonary irritation were noted there was the option to further characterize the pulmonary irritation response by conducting exposures on mice using tracheal cannulation to bypass the nose and upper respiratory tract. This procedure eliminates any sensory irritation response so that pulmonary irritation can be better studied. Vapor concentrations were continuously monitored from the air exiting the animal chamber using a hydrocarbon analyzer. Air samples were also collected over the course of the exposure and analyzed by GC/MS. Concentrations were determined based on the analytical response factors for the individual test chemicals and not a reference compound (e.g. toluene) or mixture.

Discussion

The CRI representatives strongly recommended a data review meeting once CPSC was prepared to share its data in order to compare results from both testing programs. They believed that it would provide an opportunity to resolve inconsistencies prior to publication in the scientific literature. Industry representatives also felt that their familiarity with chemical emissions from a wide variety of carpet product types and the process by which the carpets are manufactured would be beneficial to the risk assessment effort. They offered to include members of their Scientific Advisory Board, consisting of scientists outside the industry, as part of the data review. CPSC staff agreed to forward the CRI suggestions to the agency managers.

CRI sought feedback on its plans for studying chemical mixtures. CPSC and AQS staff noted two difficulties in the CPSC/AQS efforts to study defined mixtures to characterize chemical interactions in the respiratory irritation response. The first was generating vapor concentrations of multiple chemicals in the very precise combinations required by the study design. The second challenge was developing the complicated statistical approach needed to interpret the data.

Meeting on Respiratory Irritation of Carpet Chemicals

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